

# AirNow Interoperability Update

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for

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Sonoma Technology, Inc.

# CyAir

- Eight recommendations made
- Best Practices guidance developed (#1)

## Recommendations

1. Develop Best Practices guidance
2. Perform outreach and education
3. Create a cyberinfrastructure (CI) of core air quality (AQ) systems
4. Add CI to EPA contracts, grants, and procurements
5. Maintain a CyAir resource website
6. Provide CI-building tools & resources
7. Designate a community organizer/liaison
8. Develop a simple governance structure

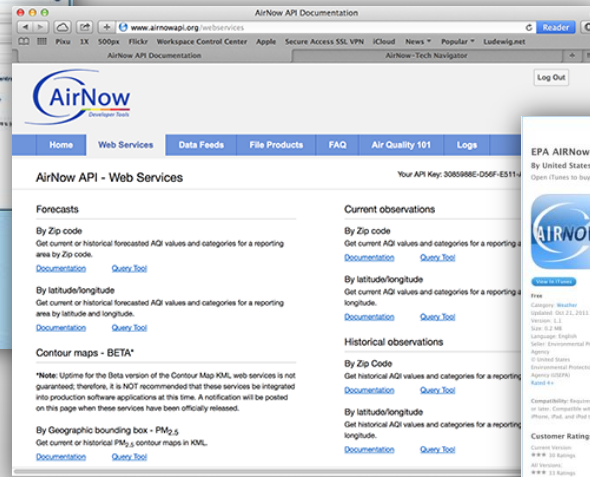
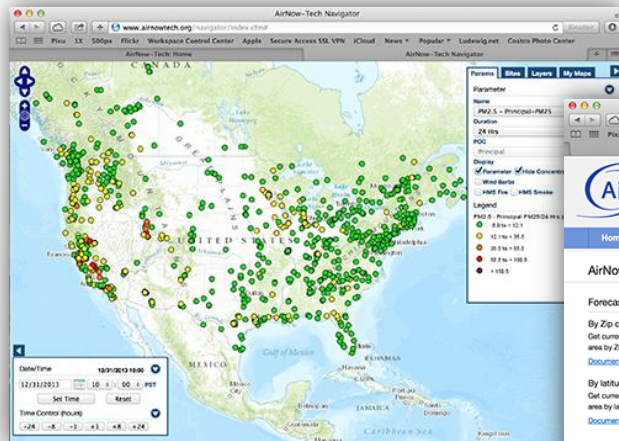
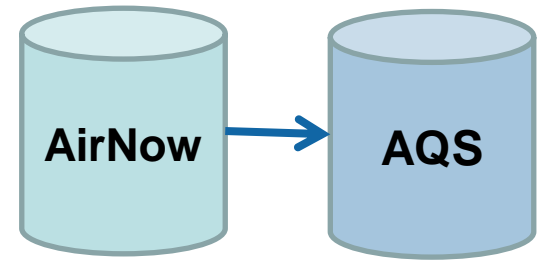
## 1 Best Practices

- Data format standards
- Naming conventions
- Web services
- Metadata
- Data publication and discovery

*Where possible, CyAir guidance and principles were applied in AirNow development projects.*

# Examples of Projects

1. Data sync web service: AirNow → AQS
2. AirNow API
3. AirNow-Tech Navigator



## Description

A RESTful web service for retrieving AirNow data

## Features

- Returns data within a specified geographic area (takes bounding box coordinates)
- Uses AQS naming conventions
- Able to limit returns to new or modified data only, for data synchronization purposes
- Returns data in the well-documented AQCSV format

## Example of a URL

<http://aqcsv.airnowgateway.org/AQCSVWebService/AQCSV.svc/queryRawData?key=3DE784D3-D699F-E511-AE73B358F8FED6F4&param=44201&dur=1&m=c&bdate=201307270000&edate=201307280000&cbdate=201307270000&cedate=201307280000&timeStd=UTC&minlat=38.54&maxlat=38.62&minlon=-121.5&maxlon=-121.3>

# Description – AirNowAPI.org


A central portal providing access to web services, RSS feeds, and file products, giving developers the tools needed to integrate air quality data into software applications (e.g., websites, mobile apps).

## Features

- **Key web services** requested by users, including
  - Forecasts and observations by zip code or lat/lon;
  - Historical peak values by zip code or lat/lon;
  - KML web services
- **A query tool** makes it possible for users to assemble and run web service requests, helping developers to quickly grasp the proper format of the API's REST-type requests and to view outputs.

Current Observation By Latitude and Longitude

**1** Latitude:  °  
Longitude:  °  
Distance:  miles  
Format:



**2** Generated URL  
`http://www.airnowapi.org/aq/observation/latLong/current/?format=application/json&latitude=37.7813&longitude=-122.4725&distance=25&API_KEY=3085988E-D56F-E511-A5516C`

**3** Output  

```
[{"DateObserved": "2013-11-15 ", "HourObserved": 11, "LocalTimeZone": "PST", "ReportingArea": "San Francisco", "StateCode": "CA", "Latitude": 37.75, "Longitude": -122.43, "ParameterName": "O3", "AQI": 17, "Category": {"Number": 1, "Name": "Good"}}, {"DateObserved": "2013-11-15 ", "HourObserved": 11, "LocalTimeZone": "PST", "ReportingArea": "San Francisco", "StateCode": "CA", "Latitude": 37.75, "Longitude": -122.43, "ParameterName": "PM2.5", "AQI": 37, "Category": {"Number": 1, "Name": "Good"}}]
```

## Features (continued):

- **Documentation** provides developers with quick answers, including
  - 1) inputs for each web service with a description, the required format, and examples;
  - 2) outputs returned by the web service with descriptions of each field.
  - 3) Frequently Asked Questions;
  - 4) an Air Quality 101 page with information about the data.

### Inputs

Parameter	Description	Format	Example
zipCode	Zip code	Text	94954
date (optional)	Date of forecast. If date is omitted, the current forecast is returned.	Date String (yyyy-mm-dd)	2012-02-01
format	Format of the payload file returned. Options: <ul style="list-style-type: none"> <li>• CSV (text/csv)</li> <li>• JSON (application/json)</li> <li>• XML (application/xml)</li> </ul>	Text	application/json
distance (optional)	If no reporting area is associated with the specified Zip Code, return a forecast from a nearby reporting area within this distance (in miles).	Number	150
API_KEY	Unique API key, associated with the AirNow user account.	Text	4d36e978-e325-11cec1-08002be10318

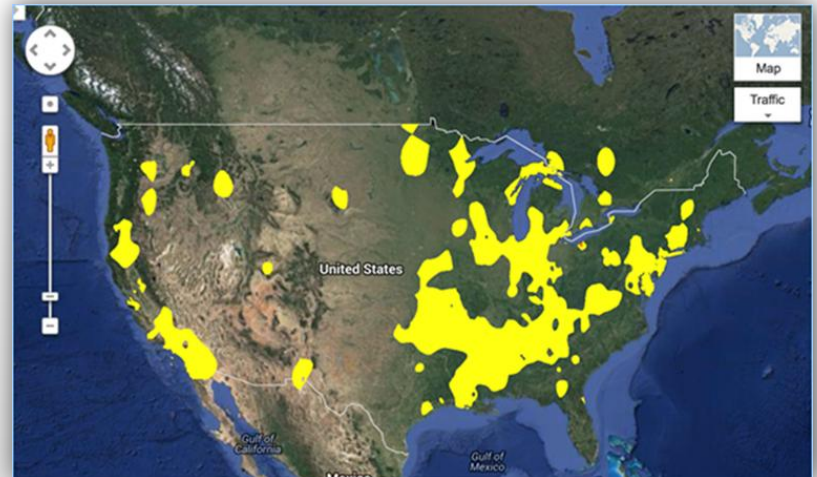
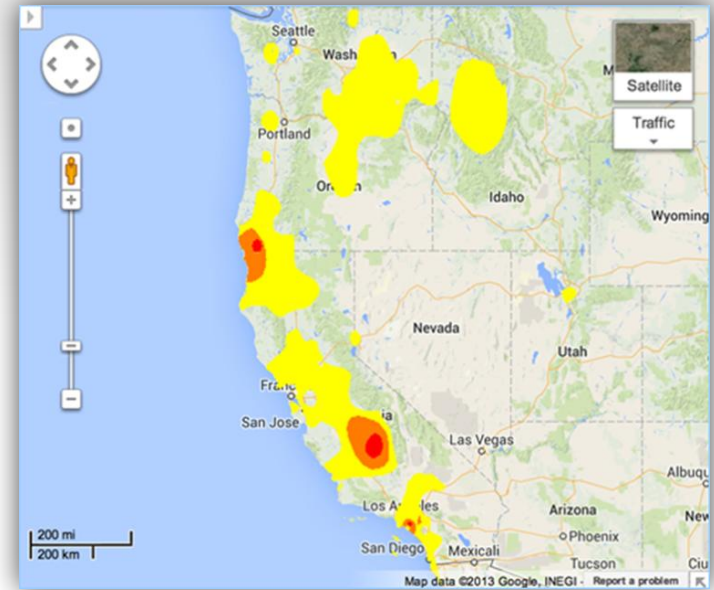
### Outputs

Parameter	Description	Format	Example
DateIssue	Date the forecast was issued.	Date String (yyyy-mm-dd)	2012-02-01
DateForecast	Date for which the forecast applies.	Date String (yyyy-mm-dd)	2012-02-02
ReportingArea	City or area name for which the forecast applies.	Text	Napa
StateCode	Two-character state abbreviation.	Text	CA
Latitude	Latitude in decimal degrees.	Number	38.33
Longitude	Longitude in decimal degrees.	Number	-122.28
ParameterName	Forecasted parameter name.	Text	Ozone
AQI	Numerical AQI value forecasted. When a numerical AQI value is not available, such as when only a categorical forecast has been submitted, a -1 will be returned.	Number	45



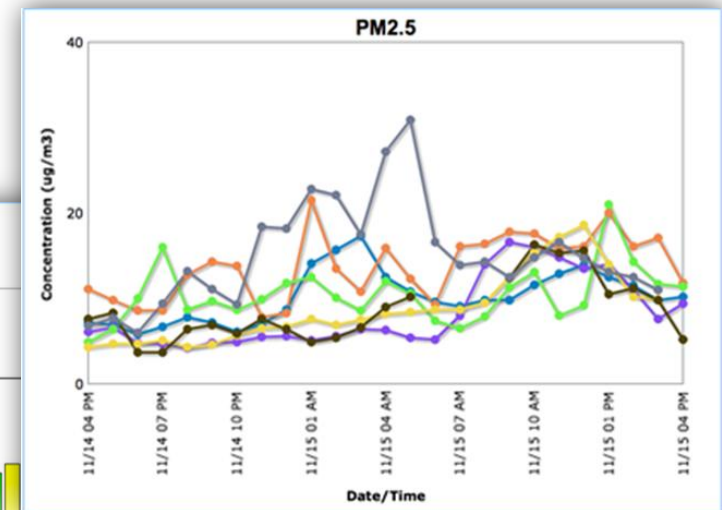
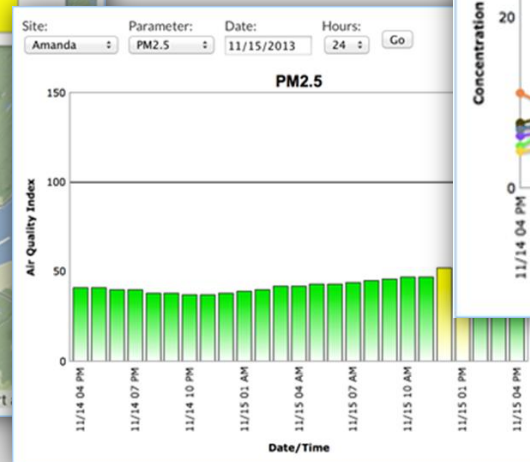
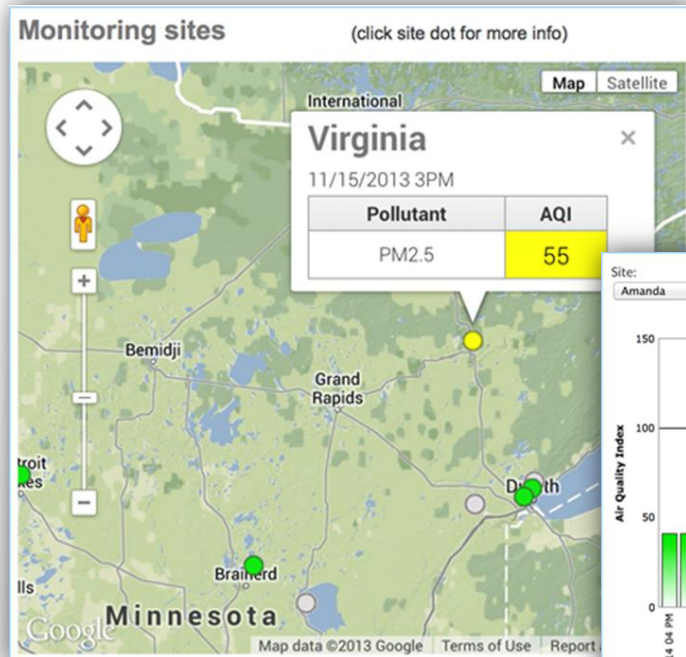
## Features (continued):

- KML Contour web services (currently in beta release) return gridded outputs of  $PM_{2.5}$ , ozone, or combined AQI values. The web service returns data contours for a user-selected geographic area.
- Operations and performance features include rate limiting, caching, and activity logging.



## Next Steps

Based on user response and requests, additions may include a web service that returns AQI and concentration values in a variety of formats (e.g., KML, CSV, JSON, XML) for a user-specified geographic area, parameter, and date/time range.





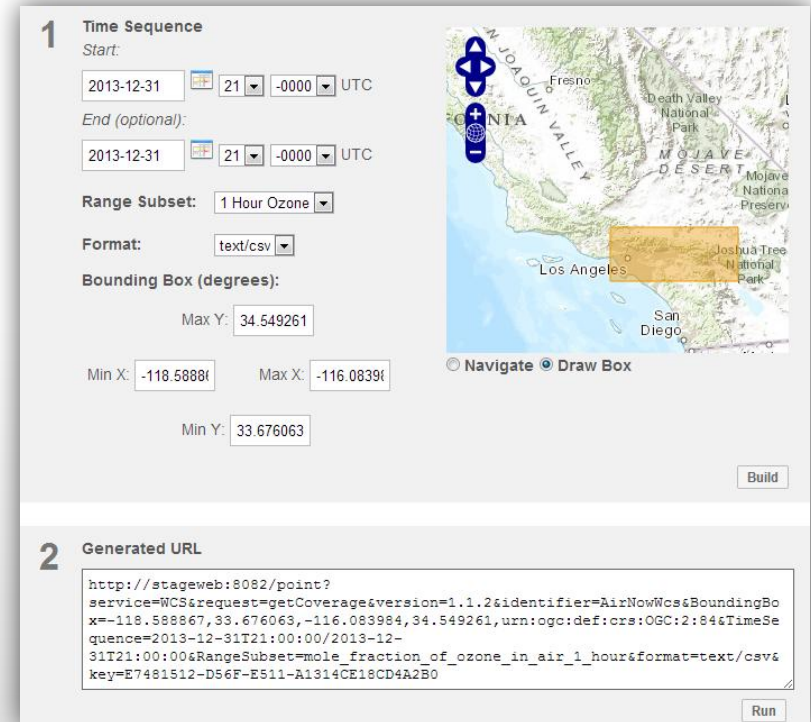
## Additional

The **community Web Coverage Service (WCS)** is an OGC standards-compliant (WCS version 1.1.2), geospatial web service. The WCS is an open source, community-supported project.

An instance of the WCS was customized for AirNow to include

- user authentication and
- data retrieval via database stored procedures.

**Note:** The WCS was deployed to a staging server, but has not yet been integrated into the production API.



The screenshot displays a web interface for configuring a Web Coverage Service (WCS) request. It is divided into two main sections: '1 Time Sequence' and '2 Generated URL'.

**1 Time Sequence**

Start: 2013-12-31 [calendar icon] 21 [dropdown] -0000 [dropdown] UTC

End (optional): 2013-12-31 [calendar icon] 21 [dropdown] -0000 [dropdown] UTC

Range Subset: 1 Hour Ozone [dropdown]

Format: text/csv [dropdown]

Bounding Box (degrees):

Max Y: 34.549261

Min X: -118.588867 Max X: -116.083984

Min Y: 33.676063

Map: A map of California is shown on the right, with a blue bounding box highlighting the Mojave Desert region. The map includes labels for 'Mojave National Preserve', 'Joshua Tree National Park', 'Death Valley National Park', 'Fresno', 'Los Angeles', and 'San Diego'. Navigation controls (compass, zoom in, zoom out, pan) are visible on the map.

Buttons: [Build] [Run]

**2 Generated URL**

http://stageweb:8082/point?  
service=WCS&request=getCoverage&version=1.1.2&identifier=AirNowWcs&BoundingBo  
x=-118.588867,33.676063,-116.083984,34.549261,urn:ogc:def:crs:OGC:2:84&TimeSe  
quence=2013-12-31T21:00:00/2013-12-31T21:00:00&RangeSubset=mole\_fraction\_of\_ozone\_in\_air\_1\_hour&format=text/csv&  
key=E7481512-D56F-E511-A1314CE18CD4A2B0

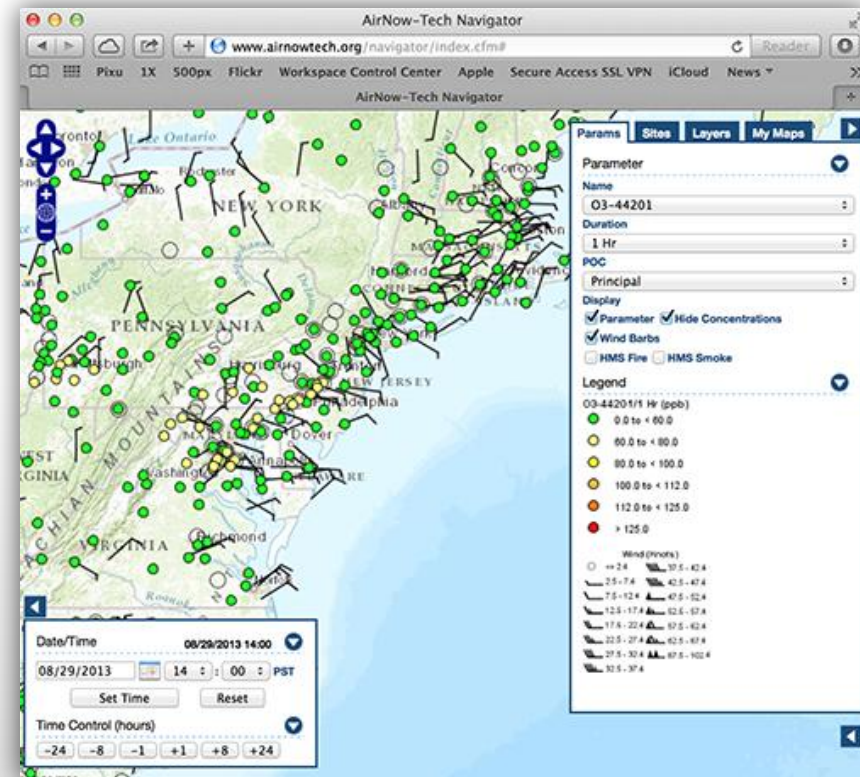
Buttons: [Build] [Run]

## Description

AirNow-Tech Navigator is a GIS viewer built into the AirNow-Tech website. With Navigator, users can view air quality and meteorological data within the AirNow system.

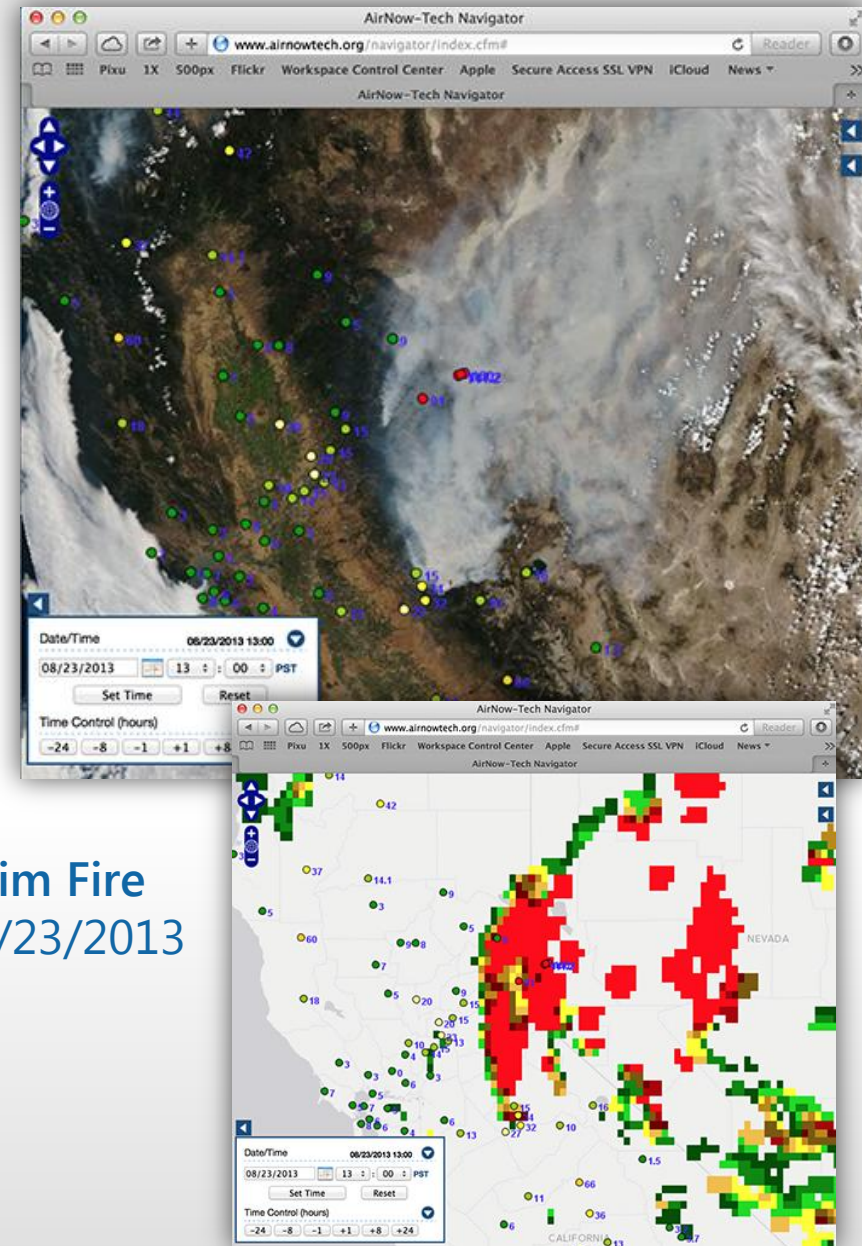
## Features

- Dynamic map – pan, zoom, change base layers; save map configurations for re-use
- Select and view point data (color-coded), show or hide concentration labels
- View meteorological data, including wind barbs
- View HMS fire locations and smoke plumes
- Run HYSPLIT trajectories
- View wind/pollution roses
- Overlay satellite data layers



## Architecture

- Viewer developed using OpenLayers and Java
- Web mapping services (WMS) developed for retrieving and displaying AirNow data
- Integration of satellite data layers using remote web map tile services (WMTS) from the NASA LANCE system (MODIS True Color and AOD, GOES visible and infrared)



Rim Fire  
8/23/2013

# Progress Toward CyAir

- Use of standard naming conventions (AirNow->AQS web service)
  - AQS naming conventions
  - Known AQCSV data format
- Use of standardized/commonly used approaches
  - WMS for Navigator data layers
  - Community WCS (not yet in production)
- Incorporation of existing web services
  - Integration of NASA LANCE WMTS
- Published documentation and helpful tools
- Planning for operations and performance
  - Rate limiting
  - Activity logging tools



# Questions?



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